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Dental Practitioner Supply and Demand Model - Methodology Paper

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List of Acronyms and Abbreviations

ABS	Australian Bureau of Statistics
ADA	Australian Dental Association
AFHW	Australia's Future Health Workforce
Ahpra	Australian Health Practitioner Regulation Agency
APRA	Australian Prudential Regulation Authority
CDBS	Child Dental Benefits Scheme
DMS	Derived Major Specialty
ERP	Estimated Resident Population
FFA	Federation Funding Agreement
FTE	Full-Time Equivalent
GLM	Generalised Linear Model
MBS	Medicare Benefits Schedule
NHWDS	National Health Workforce Datasets
SA4	Statistical Area 4

1.0 Introduction

This document provides the methodology used for the dental workforce supply and demand model. It aims to quantify the supply and demand for dental practitioners between 2024 and 2038, using data collected from several sources between 2014 and 2023.[1] This work builds upon previous studies prepared by the Department of Health, Disability and Ageing (the Department) and from other entities, such as Health Workforce Australia.

2.0 Modelling Overview

2.1 Scope

In Australia, dental practitioners must be registered with the Australian Health Practitioner Regulation Agency (Ahpra) to practise. There are different registration types corresponding to different levels of training and experience. Most oral health practitioners have general registration. General registration divisions include dentists, dental prosthetists, dental hygienists, oral health therapists and dental therapists. Dentists may also qualify and be eligible for specialist registration. There are 13 approved dental specialties in Australia. For more information please see: Dental Board of Australia – accredited programs.

Dental practitioners who have overseas qualifications and do not qualify for general registration may be eligible for Limited registration. There are two types of Limited registrations: *Postgraduate Training or Supervised Practice,* and *Teaching or Research.*

In this study, registered dental practitioners are grouped into two categories:

1. **Dentists** (including General and Specialist Dentists) and
2. **Allied dental practitioners including:**
    - Dental hygienists
    - Dental therapists
    - Oral health therapists
    - Dental prosthetists

Two dental professions, dental assistants and dental technicians, are not required to be registered with Ahpra. As a result, no national level dataset is currently available for these two unregistered dental professions, and they ***will not*** be included in the current modelling. They will be considered for inclusion in the future as more reliable data becomes available.

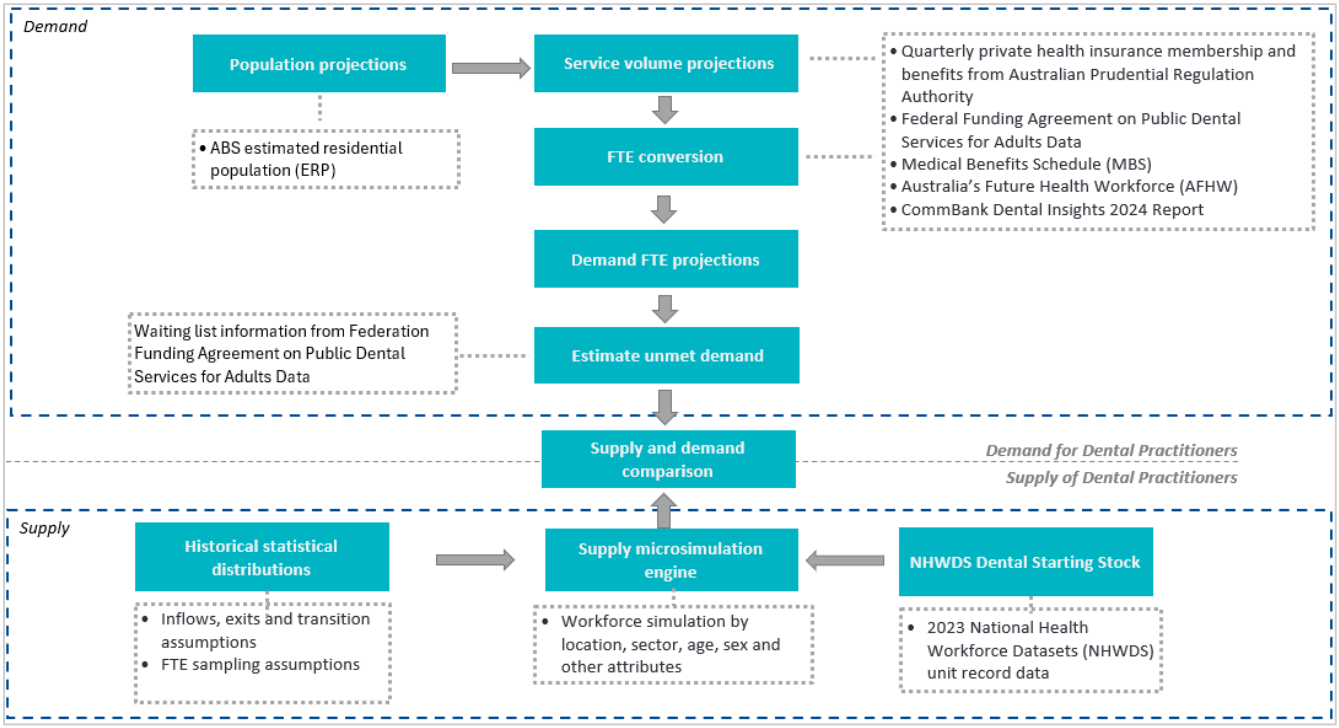
Modelling has been undertaken at the Statistical Area 4 (SA4) geography where data availability permitted. However, results will be published at state and territory level, with their aggregation used to produce the national results. The modelling results for each of the four allied dental practitioner types (outlined above) will only be made available at the national level.

[1] The workforce projections have been estimated over a 15-year period, rather than the 25-year horizon used in medical supply and demand studies, due to the relatively shorter training pipeline for dental practitioners. Also, the policy environment in Australia's oral health sector is relatively complex and evolving. With multiple policy reviews and reforms currently underway or under consideration, projections beyond the 15-year horizon are unlikely to provide meaningful insights.

This study also models supply and demand separately for the private and public sectors. This approach is particularly relevant given that most dental practitioners are employed in the private sector.

Figure 1 provides an overview of the modelling process, outlining key data inputs.

Figure 1: Overview of the Dental modelling process



3.0 Dental Supply

The 2018 to 2023 AFHW data on dental practitioners is used to model the supply of dental professionals. The model uses a microsimulation approach where attributes such as entries and exits to the workforce and practitioner Full-Time Equivalent (FTE) are modelled distinctly. The supply methodology begins by identifying the current stock of dental practitioners, analysing their demographic profile and historically observed work patterns. Statistically significant predictors of future dental workforce supply are selected, and their historical distributions are measured to allow the development of a microsimulation model.

The microsimulation works at a yearly time-step, tracking the progression of dental practitioners throughout their career. Each year, it accounts for entries, removes practitioners who take temporary or permanent leave, and simulates transitions of practitioners between geographic locations. The following sections describe how each component is defined and modelled.

3.1 Key data inputs

The key dataset used for the supply model is extracted from the following sources:

#	Source	Description and use in model
1	Australia's Future Health Workforce (AFHW) dataset	The AFHW datasets are created from the National Health Workforce Datasets (NHWDS) for modelling purposes. A sequence of rules (supply criteria) is applied to each NHWDS to determine which practitioners meet the definition of supply for each profession (and sub-groups where applicable). The headcount and workload of these practitioners, along with other variables required for modelling, are included, derived or imputed in the AFHW datasets. The AFHW dataset contains unit record data on dental practitioners, including demographic variables and information on their career (such as hours worked which is converted to FTE).

3.2 Historic and starting stock

The AFHW data is a unit record longitudinal dataset, where each respondent is assigned a unique identifier that can be linked across multiple years. To be in scope, dental practitioners must be:

1. registered as a dental practitioner with Ahpra
2. working in their registered profession in Australia, including those on extended leave, and
3. working clinical hours.

3.2.1 Total Hours (Full-Time Equivalent)

Dental practitioner total hours (clinical and non-clinical) are used in modelling supply. If a practitioner is employed but on extended leave (defined as a period of over 3 months), their hours are halved for simplicity, assuming they worked an average of 6 months during the year.

One FTE is defined as 38 self-reported weekly average hours in the AFHW dataset (across 46 weeks in the year).

3.2.2 Sector

In the AFHW dataset, a dental practitioner's sector (public, private or both) is derived based on reported hours within public and private sector:

- Public – All reported hours in the public sector.

- Private – All reported hours in the private sector.
- Both – Reported hours in both the public and private sectors.

For modelling purposes, the FTE of practitioners by sector is estimated based on their reported public and private hours to more accurately capture the workforce in each sector.

3.2.3 Practitioner Type

Dental practitioners are assigned a practitioner type based on the division under which they are registered. Table 1 shows the various divisions and the corresponding dental practitioner type for modelling purposes.

Table 1: Dental Practitioner type

Dental Practitioner Type	Dental Division
Allied Dental Practitioners	Dental Hygienists
	Dental Therapists
	Oral Health Therapists
	Dental Prosthetists
Dentists (including Specialist Dentists)	Dentists

3.3 Measuring entries, exits and transitions

The AFHW dataset enables tracking of individuals as they age, relocate, progress in their careers and transition in and out of the workforce. Historical data relating to entries, exits and transitions is used to determine future trends based on analysis of historical demographic probabilities and distributions.

The demographic probabilities and distributions are sampled to understand the effects of age, sex, place of initial qualification, dental practitioner type and sector on workforce patterns.

3.3.1 New entries

A new entry is defined as a practitioner who is within the scope of 'supply' in the base year (i.e. 2023), but not within 'supply' in previous 4 years.[2] New entries into the dental health workforce include Australian/domestic graduates and international graduates.

The AFHW dataset is used to identify domestic graduates and international graduates.

[2] The 4-year period is used because practice considerations become less relevant beyond that timeframe. This approach is applied to both entries and exits.

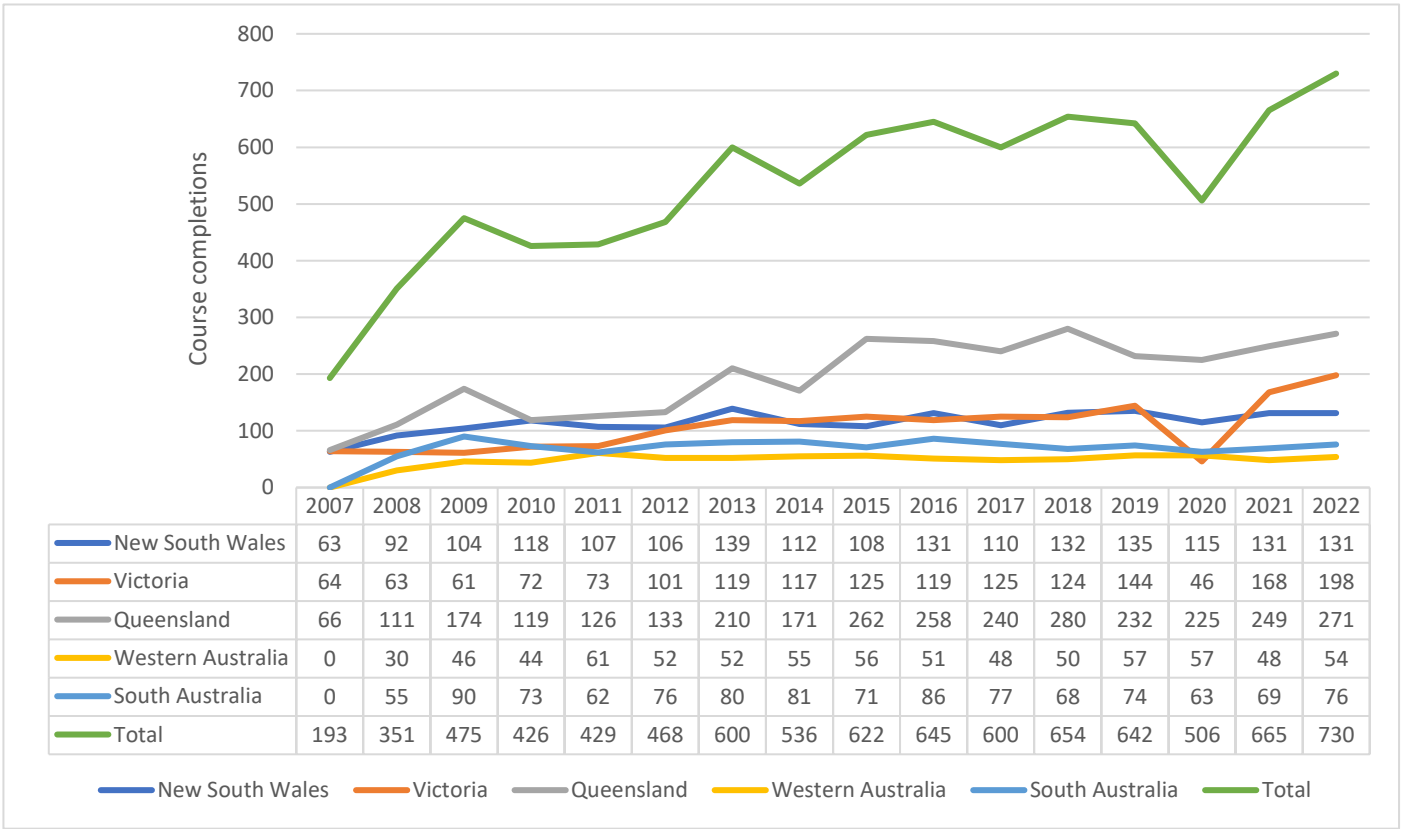
Domestic and international graduates

A new domestic graduate is defined as a practitioner whose initial qualification was obtained in Australia or New Zealand, while an international graduate is defined as a practitioner whose initial qualification was obtained outside of these countries.

Figure 2 below presents publicly available data from the Department of Education on course completions that lead to registrations as a dental practitioner. The data shows a modest 1.7% increase in dental graduate completions between 2018 and 2021. While a slight rise in graduate numbers was observed in 2022, this is likely attributed to the effects of COVID-19 recovery. However, it is important to note that course completions have not always translated into workforce participation.

There is no publicly available data on the number of international graduates entering the dental workforce. Therefore, the supply model assumes a constant number of new entries over the projection period, based on the number of new entries in 2023 for both domestic and international graduates. The only exception is the number of new entries to the dental hygienist and dental therapist division which are assumed to be 0 from 2024 onwards. This is because most universities now offer oral health programs that combine both fields of study rather than separate courses in dental hygiene or therapy.

Figure 2: Completion counts for dental courses, 2007–22



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
New South Wales	63	92	104	118	107	106	139	112	108	131	110	132	135	115	131	131
Victoria	64	63	61	72	73	101	119	117	125	119	125	124	144	46	168	198
Queensland	66	111	174	119	126	133	210	171	262	258	240	280	232	225	249	271
Western Australia	0	30	46	44	61	52	52	55	56	51	48	50	57	57	48	54
South Australia	0	55	90	73	62	76	80	81	71	86	77	68	74	63	69	76
Total	193	351	475	426	429	468	600	536	622	645	600	654	642	506	665	730

Source: Department of Education, Higher Education Statistics, 2022 (Student Data - Department of Education, Australian Government).

3.3.2 Exits and re-entries

Exits from the dental workforce are derived from historical AFHW data by longitudinally tracking individual practitioners' participation in the workforce. Dental practitioners who are identified in the AFHW data in a given year but not in the following year are classified as exits. Exits are modelled by age, sex, dental practitioner division, sector and state of primary workplace, as covariates.

These one-period exits are further classified as temporary or permanent exits.

- **Temporary exit**: refers to a dental practitioner who leaves the workforce after working for at least one reporting period (i.e. one year) but returns to the dental profession within a 4-year period.[3] The point of re-entry is estimated based on the rate at which dental practitioners who leave the workforce return in subsequent years. The modelling of re-entry probabilities includes the same covariates as exits i.e. age, sex, place of initial qualification, dental practitioner type and state of primary workplace.
- **Permanent exit**: refers to a dental practitioner who, after working for at least one reporting period (i.e. one year), leaves the workforce and does not return within a 4-year period.

3.3.3 Sector transitions

Transitions between the 3 sectors: public, private and both (as defined in section 3.1.2), are modelled as the probability of a dental practitioner changing their sector from one sector to another. Covariates used to determine sector transition rates for dentists are dental practitioner's age, sex, place of initial qualification, state of primary workplace and sector. For allied dental practitioners, all except the place of initial qualification, are used as covariates due to the small numbers of international graduates in this group.

3.3.4 Interstate transitions

Interstate movement of dental practitioners is estimated based on the probability of dental practitioners changing their primary place of work from one state to another. Covariates used to determine transition rates and destinations are dental practitioner's initial state, sex, place of initial qualification, dental practitioner type and sector.

3.3.5 Dental practitioner type transitions

Practitioner type transitions refer to dental health practitioners who remain in the workforce (supply) but move to another dental practitioner type, e.g. move from an allied dental practitioner to dentist.

[3] The 4-year period is used because practice considerations become less relevant beyond that timeframe. This approach is used for both historical and future workforce exits.

Analysis of the dental workforce from AFHW data revealed very small number of transitions between allied dental practitioner and dentist groups. Therefore, practitioner type transitions are not incorporated into the modelling framework.

3.3.6 Estimating Full-Time Equivalent of entries, re-entries and transitions

The number of FTE each dental practitioner produces is a central component of the model. FTE is a measure which can vary significantly between individuals and years. One FTE is defined as 38 self-reported weekly average hours worked.

To account for the variations in FTE by various demographics of dental practitioners, the simulated dental workforce FTE distribution is estimated based on age, sex, place of initial qualification, state of primary workplace and sector. This is done by:

1. Re-sampling an existing dental practitioner's FTE annually to reflect their demographic attributes, as it may change from year to year. Additionally, their FTE is adjusted by a time-dependent modifier based on changes to the average FTE observed over the past 5 years.
2. Additional FTE adjustments, in the form of a series of multipliers, are then applied to a practitioner's FTE, following one of the workforce status changes below:
    - a workforce exit or entry, or
    - a change in state of workplace

These adjustments are applied after any the FTE re-sampling has been applied. This is because the adjustments effectively adjust for breaks in regular employment.

3.4 Supply Modelling

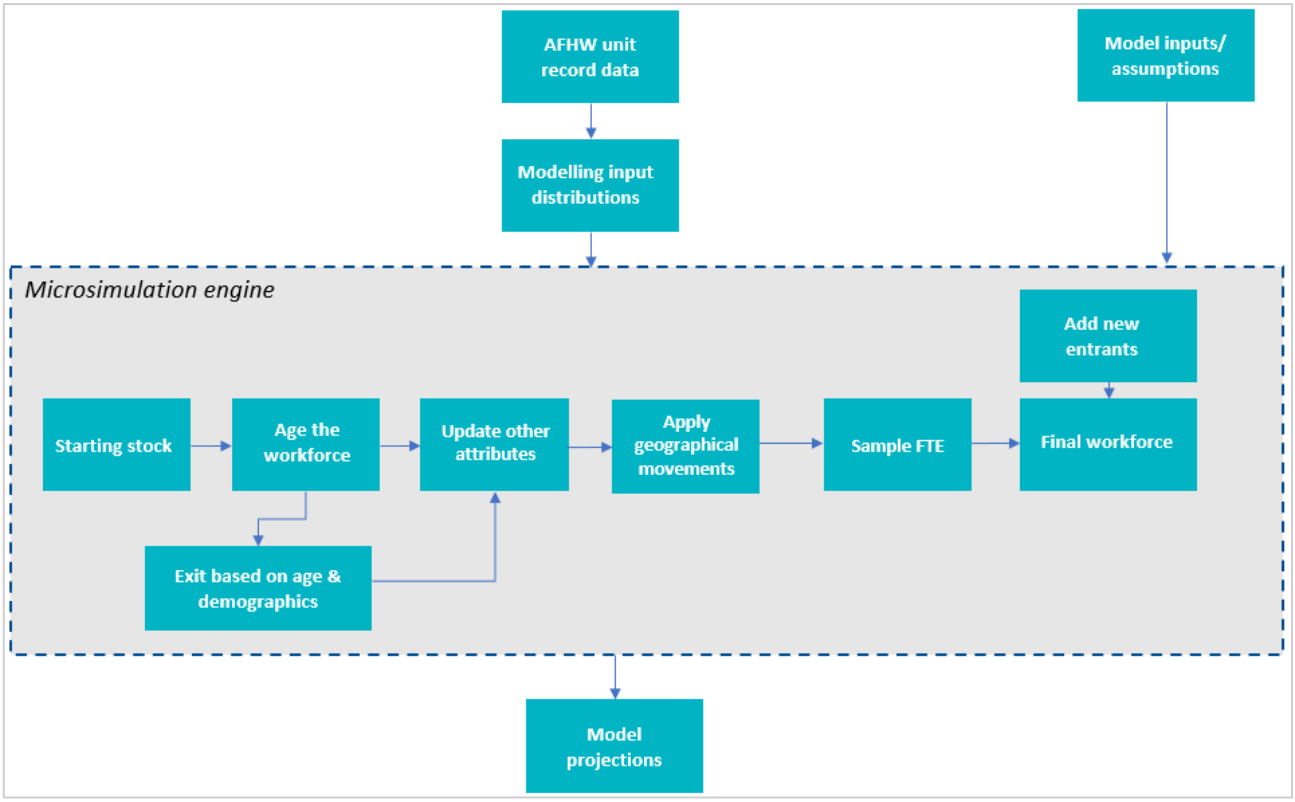
A microsimulation process will be used to model supply for each of the dental practitioner types. Dental practitioners are sampled in accordance with historical distributions.

3.4.1 Supply microsimulation

A microsimulation process is used to project supply of dental practitioners. An overview of this process is shown in Figure 3. The supply model uses the following attributes:

1. FTE based on 38 hours per week
2. sex
3. age
4. sector (public, private or both)
5. practitioner's division
6. place of initial qualification (domestic or international)
7. primary work location (state, SA4).

Figure 3: The supply microsimulation process



In each iteration of the microsimulation:

1. The workforce is aged, and some practitioners exit the workforce based on their age, sex, sector, division, place of initial qualification and state of primary workplace.
    a) Exits are sampled to determine if the exit is permanent or temporary.
    b) Practitioners that temporarily exit will re-enter the workforce during a subsequent period of up to 4 years, in accordance with the historical distribution of re-entries following up to 4 periods of absence.
2. Geographical movements are applied to practitioners based on historic state migration patterns broken down by sex, place of initial qualification and state of primary workplace.
3. FTE is updated based on smoothed historical FTE year-on-year changes by age, unless a practitioner:
    a. geographically transitions to a different state or
    b. returns from a temporary exit.
4. Dental practitioners that are flagged for re-entry are brought back into the workforce based on a re-entry probability, which is determined by factors such as age, sex, place of initial qualification and state of primary workplace. The FTE for re-entering practitioners is sampled from a distribution modelled on historical AFHW data.

5. New practitioners are added to the workforce either as:
    a. a domestic graduate or
    b. an international graduate.
6. The modelling process iterates annually, where the number of practitioners in the following year is calculated as the number of practitioners in the current year, minus the number of practitioners exiting and transitioning-out, plus those entering the workforce and transitioning-in in the new year. In other words:

$$\text{Supply}_{(t+1)} = \text{Supply}_{(t)} - \text{Exits}_{(t+1)} + \text{Entries}_{(t+1)} + \text{Net transitions while staying employed}_{(t+1)}$$

3.5 Assumptions

#	Caveat/Limitation	Description and implications
1	Static sampling assumptions	The microsimulation module applies static sampling distributions based on historical data from 2018 to 2023 to simulate projected behaviour except for average FTE distribution, which is adjusted based on historical trends.
2	New entries	The supply model assumes a constant number of new entries over the projection period, based on the number of new entries in 2023 for both domestic and international graduates. The only exception is the number of new entries to the dental hygienist and dental therapist division which are assumed to be 0 from 2024 onwards. This is because most universities now offer oral health programs that combine both fields of study rather than separate courses in dental hygiene or therapy.
3	COVID-19 impact	The effects of COVID-19 pandemic on the affected years (2020-2021) remain unclear and will be clarified through further analysis of updated data. The study excludes 2020 from the demand modelling due to the observed dip in the demand activity. The supply model also excludes 2020 from the historical data used for modelling features that may have been impacted by the COVID-19 pandemic, such as FTE sampling, entry allocations and state migration. The potential impact of COVID-19 pandemic on workforce supply is still unknown.
4	Technological change	Technological improvements during the projection period that may affect workforce FTE in providing primary care are not considered.

4.0 Dental Demand

Demand is measured in terms of observed utilisation of oral health services which captures expressed (observed) service demand for dental services across a variety of care settings. Historical patterns of usage are examined and used to estimate the future demand for dental practitioners. Estimation of future demand for oral health services also considers the Australian Bureau of Statistics (ABS) Population Projections.

4.1 Key data inputs

The key datasets used for the demand model are extracted from the following sources:

#	Source	Description and use in model
1	Australian Prudential Regulation Authority (APRA) data	APRA publishes statistics on the private health insurance (PHI) industry on a quarterly basis. The statistics cover the areas of membership, coverage, benefits paid, medical gap, medical devices or human tissue products, and medical services.
2	Medicare Benefits Schedule (MBS) data	Contains data on patients billed through the MBS, including patient demographics such as sex, age, and location, service provider location, the specific MBS item and benefit paid. For dental, the MBS data also captures the services delivered under the Child Dental Benefits Scheme (CDBS).
3	Federation Funding Agreement (FFA) for Adult Public Dental Services – Reporting Data	States and territories receive FFA funding for public dental services for adults and are required to report on key measures bi-annually, which includes number of services patients received, number of services delivered and number of patients on waiting lists, and average waiting times.
4	Australian Dental Association (ADA) and CommBank Health – Dental Insights Reports	The annual Dental Insights Reports are based on survey of dental practitioners/practices across Australia and provides data on key trends impacting the dental profession.
5	Population and household projections based on Australian Bureau of Statistics (ABS) data	Population and household projections developed by the Department based on ABS Series B population projections and the ABS Census household distribution type. Population projections by age group, sex, geography and year.

4.2 Estimating demand activity by sector

The total baseline demand activity for dental services is first estimated by combining the count of dental services delivered from 2018 to 2023 (excluding 2020[4]) from following data sources:

- **MBS Data:** Number of services delivered by practitioners who are classed as Derived Major Specialty (DMS) group Dentist or Allied Health – Dental and Oral5, to patients in each state and territory, age group and sex**.**
- **FFA Data:** Number of public dental services delivered to patients in each state and territory.
- **APRA Data:** Number of services delivered in each state and territory for general (Ancillary) treatment for dental care.

The projected total demand activity is then attributed to the public or private sector using the observed workforce size (i.e. public and private FTE proportions) in the AFHW 2023 data. This approach is adopted to estimate the overall demand for dental practitioners because demand in the public sector is highly driven by supply and the cost of private sector services. Additionally, while the FFA data exclusively represents public services and APRA data focuses solely on private services, MBS data consists mostly of services under Child Dental Benefits Scheme which can be claimed from either public or private clinic, making it challenging to separate public and private demand.

FFA and APRA data do not have patient demographics information available such as age and sex, therefore disaggregation by these variables are estimated using Estimated Resident Population from ABS.

4.3 Projection of Demand Activity

The process of projecting the count of services over the forecast period consists of the following key steps:

1. Calculate and project service utilisation using a Generalised Linear Model (GLM). The covariates in the GLM model include year, patient age group, patient sex and provider location, with separate models for each state/territory. The model assumes that the providers and their patients are in the same state/territory. Population projections are used for estimation of the population at risk.
2. Demand activity projections are then converted to FTE by comparing the demand values against the supply FTE from AFHW dataset. Specifically, it involves the following steps:

[4] The year 2020 has been excluded from the modelling because the demand data revealed a significant decline in the dental service utilisation, likely due to restrictions on dental services during the COVID-19 pandemic. According, to AIHW, approximately around 13% of Australians aged 15 and over delayed seeing a dentist in 2020-21 because of the pandemic (Oral health and dental care in Australia 2023).

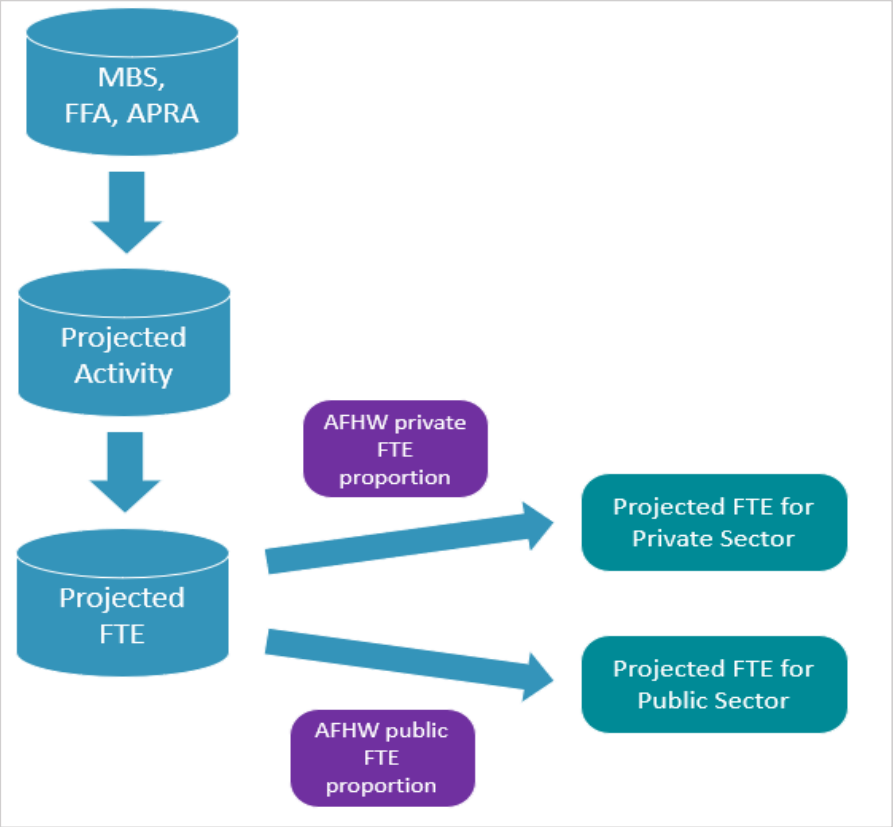
[5] The Derived Major Specialty (DMS) classification within MBS data provides a single specialty, derived to represent the major/highest qualification and/or major activity of a provider during the observed period according to key service groups.

a. Estimate historical FTE-to-activity ratios by practitioner type and state/territory and use that to project the FTE-to-activity ratio for the forecast period.

b. Multiply the projected FTE-to-activity ratio with the demand activity projections for each practitioner type and state/territory for each forecast year. This forms the baseline projection.

3. The projected demand FTE projections are then apportioned to public or private sector based on public and private FTE proportions in the 2023 supply data. Figure 4 presents an overview of demand FTE modelling by sector.

Figure 4: Projection of demand FTE by sector



4.4 Demand scenarios

Public sector: Unmet demand scenario

Unmet demand for dental services occurs when there are not enough services to meet the needs of the people who require them. For example, people seeking dental care but unable to access care due to affordability and/or availability issues.

The ABS Patient Experience Survey 2022-23 revealed that approximately 30% of people aged 15 years and over, who needed to see a dental professional delayed or did not attend an appointment at least once in the previous 12 months. Of these around 18% reported cost as the primary reason for delaying or avoiding care. This barrier is more significant for individuals with lower socioeconomic status.

Individuals unable to access/afford dental care, often either delay treatment or rely on the public dental system if they are eligible. However, the public dental system faces severe strain, with significant waiting times that may discourage some individuals from seeking care altogether, resulting in their exclusion from waiting lists. Unfortunately, there is no comprehensive data available to accurately capture this unmet need for dental care within the public sector.

This study uses the FFA data from 2022 and 2023, which includes the number of patients on the waiting lists and those who received public dental services, to estimate unmet demand in the public sector. For each state, an average proportion of patients awaiting public dental services over 2022 and 2023 is estimated. Under the *unmet demand scenario,* demand is estimated by increasing the baseline demand by this average proportion across the entire projection period.

Private sector: unutilised clinical work hours scenario

The latest ADA and CommBank Dental Insights Report 2024[6] highlights that cost of living pressures have led to reduced patient demand for private dental services, with metropolitan practices experiencing greater revenue pressures. The number of unutilised clinical working hours each week have increased, particularly in metropolitan areas. The report shows that an average practice had 3.1 dental chairs, 6.2 FTE staff and 14 unutilised clinical work hours per week in 2023. Consequently, baseline demand for the private sector should be adjusted downward to account for these unutilised work hours, providing a more accurate representation of demand.

To estimate demand under the *unutilised clinical work hours scenario,* the supply FTE in the Monash Modified Model – Category 1 (MM1 i.e. metropolitan) areas is adjusted to account for unutilised clinical work hours. This adjustment is used to estimate the FTE-to-activity ratio, which is then multiplied by demand projections for private sector to calculate the projected FTE demand for the private sector. In other words, when converting private sector demand into the required FTE, the hours worked by each dental practitioner in the private sector in MM1 location is reduced by 4.5 hours (14 hrs/3.1).

4.5 Assumptions

#Caveat/Limitation		Description and implications
1	COVID-19 impact	The effects of COVID-19 are not explicitly modelled, however, the year 2020 is excluded from the estimation of demand activity. This is because following the COVID-19 outbreak in March 2020, restrictions were imposed on the dental industry that only allowed dentists to perform emergency procedures to stabilise serious dental problems and prevent hospitalisation. Nonetheless, the model may not fully capture long-term changes in demand patterns resulting from the pandemic.

[6] Australian Dental Association, 2024, Unearthing drivers of patient demand and practice productivity, CommBank Dental Insights, accessed 6 December 2024.

#	Caveat/Limitation	Description and implications
2	Same state for patients and providers	The model assumes that the providers and their patients are located in the same state/territory.
3	Combining data from different sources	MBS, FFA and APRA data are combined to estimate total baseline demand. Differences in data collection methods and definitions across these sources could introduce inconsistencies.
4	Disaggregation of demand by age and sex	FFA and APRA data do not have patient demographics information available such as age and sex, therefore, disaggregation by age group and sex are estimated using Estimated Resident Population from ABS.
4	Constant public/private FTE proportion for sector split of projected FTE	The model assumes similar growth rates for demand in both the private and public sectors. This approach enables the estimation of overall demand for dental practitioners, as public sector demand is highly driven by supply and the cost of private sector services. Additionally, while the FFA data exclusively represents public services and APRA data focuses solely on private services, MBS data consists mostly of services under Child Dental Benefits Scheme which can be claimed from either public or private clinic, making it challenging to separate public and private demand.
5	Constant proportion of patients on the waiting lists	The proportion of individuals receiving services in the public sector compared to those on waiting list is assumed to remain constant over time. This means that any increase in demand over time will lead to a proportionate increase in the number of people on waiting lists.
6	Uniform patient demographics distribution for unmet demand	The unmet demand is assumed to be uniformly distributed across all demographic groups, as patient demographic information is not available from the waiting list data.
7	Unutilised clinical work hours per dental practitioner	For simplicity, unutilised clinical work hours per dental practitioner is calculated as the average unutilised clinical hours per practice (14) divided by 3.1. This approach assumes the following: ○ Per practice basis: The 14 unutilised clinical work hours are applied on a per practice basis. This is because, the survey question asked for the 2024 Dental Insights Report was: *Approximately how many clinical hours are not utilised in an average week in your practice?* ○ FTE staff and dental chairs: Based on consultations with the ADA, we assume that 50% of the staff in an average practice are dental practitioners. So, out the 6.2 FTE staff,

#Caveat/Limitation	Description and implications
	3.1 are assumed to be dental practitioners. This assumption is also supported by the fact that there are on average 3.1 dental chairs reported per practice. ○ Fixed reduction in hours: The reduction of 4.5 hours per staff member is a constant value, unaffected by changes in demand or other external factors.

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All information in this publication is correct as at April 2026.